

PROCEEDINGS
OF
THE ROYAL SOCIETY.

1837.

No. 30.

November 16, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair,

"Description of a new Barometer, recently fixed up in the Apartments of the Royal Society; with remarks on the mode hitherto pursued at various periods, and an account of that which is now adopted, for correcting the observed height of the mercury in the Society's Barometers." By Francis Baily, Esq., Vice-President and Treasurer, R.S.

The barometer, here alluded to, may in some measure be considered as two separate and independent barometers, inasmuch as it is formed of two distinct tubes dipping into one and the same cistern of mercury. One of these tubes is made of *flint* glass, and the other of *crown* glass, with a view to ascertain whether, at the end of any given period, the one may have had any greater chemical effect on the mercury than the other, and thus affected the results. A brass rod, to which the scale is attached, passes through the framework, between the two tubes, and is thus common to both: one end of which is furnished with a fine agate point, which, by means of a rack and pinion moving the whole rod, may be brought just to touch the surface of the mercury in the cistern, the slightest contact with which is immediately discernible; and the other end of which bears the usual scale of inches, tenths, &c.; and there is a separate vernier for each tube. A small thermometer, the bulb of which dips into the mercury in the cistern, is inserted at the bottom: and an eyepiece is also there fixed, so that the agate point can be viewed with more distinctness and accuracy. The whole instrument is made to turn round in azimuth, in order to verify the perpendicularity of the tubes and the scale.

It is evident that there are many advantages attending this mode of construction, which are not to be found in the barometers as usually formed for general use in this country. The absolute heights are more correctly and more satisfactorily determined; and the permanency of true action is more effectually noticed and secured. For, every part is under the inspection and control of the observer; and any derangement or imperfection in either of the tubes is immediately detected on comparison with the other. And, considering the care that has been taken in filling the tubes, and setting off the

scale, it may justly be considered as a *standard barometer*. The present volume of the *Philosophical Transactions* will contain the first register of the observations that have been made with this instrument.

Mr. Baily then enters into a description of the several corrections that are required for the various kinds of barometers, in order to make them comparable with one another ; and treats of each of these in their order. First as to the correction for temperature, both of the mercury and of the scale ; next for capillarity ; and afterwards for the height of the barometer above the level of the sea. A table is given for the first of these corrections ; and a convenient formula for the latter : the correction for capillarity is constant, and of very small magnitude.

The author next describes the mode in which the observations of the barometer have, from time to time, been recorded in the Meteorological Journal of this Society ; and points out several inaccuracies which have occasionally been committed in this department, for want of an uniform plan of reduction. Now this state of confusion and uncertainty he remarks ought not to exist in a meteorological journal emanating from this Society, more especially as the true values are as easily attainable as the approximate ones. And although, in a general point of view, the minute differences caused by such errors may be unimportant, yet as appeals are frequently made to the barometer of this Society, as a standard, by persons engaged in important researches, the most scrupulous accuracy ought to be adopted and pursued, and the fullest explanation placed on record. And Mr. Baily says that notwithstanding the details which he has given may create some doubt respecting the accuracy of the past, yet he is persuaded that the system now pursued will inspire more confidence for the future. It is on this account that he has entered thus at large on the subject ; trusting that what he has stated will not only tend to preserve for the future a more correct and uniform system, but also justify the Council in directing that the register should henceforth contain the daily observations *uncorrected*, and thus prevent the possibility of any similar confusion and mistakes hereafter.

Mr. Baily then adverts to the height of the Society's barometer above the mean level of the sea ; a subject of much interest to many persons engaged in various pursuits, but which appears, from the notes attached, at different periods, to the meteorological journal of this Society, to be involved in some confusion and uncertainty. Thus, prior to the year 1823, the cistern of the barometer is said to be 81 feet above the level of low-water spring tides at Somerset House ; but without any information how this was connected with the sea. From 1823 to 1825, both inclusive, it is said to be 100 feet above the same level. And from 1826 to 1836, both inclusive, the above indication is omitted, and the height is said to be 83 feet $2\frac{1}{2}$ inches above a *fixed mark* on Waterloo Bridge ; or "above the mean level of the sea (presumed about) 95 feet." The discordance between the 81 feet and the 100 feet is easily accounted for by the fact that

the old barometer, prior to 1823, was fixed up in the Council-room of the Society, or the contiguous ante-room : but when Mr. Daniel's barometer was finished, at the end of the year 1822, it was fixed up in the closet adjoining the library, on the floor which is immediately over the Council-room ; the assumed difference in the elevation of the two floors (namely, 19 feet) having since been ascertained to be correct.

With respect to the new reference of altitude, namely, the fixed mark at Waterloo Bridge, much doubt has frequently been expressed about its existence, since no person had been able to discover it. The fact is that there is no mark, in the common acceptation of the term ; but the intended reference is nevertheless more conspicuous, more durable, and more convenient than any mark that could have been inscribed by hands. This standard mark, or level, was fixed on by Mr. Bevan in the year 1827, at the request of the Council of this Society : and it is the surface of the granite pedestal at the base of the columns, at the north abutment of the bridge, and on the eastern side ; which is about 5 feet above the lowest platform, or landing, at the stairs. Nothing therefore was wanting but the difference of level between this mark and the one made by Capt. Lloyd at London Bridge, the height of which above the mean level of the sea had been determined by him. This has been recently done by Sir John Rennie, at the request also of the Council : and the result of the whole is, that the cistern of the barometer is 97 feet above the mean level of the sea.

The author concludes his paper with some remarks on the propriety of the position of the several meteorological instruments of the Society. With respect to the *barometer*, he says he is not aware that any objection can be offered ; and as to the *hygrometer*, the observations have been found, by recent trials, not to differ materially from some expressly made in another position, at King's College, which was considered to be more favourable for such experiments. It therefore only remains to speak of the external *thermometer* and of the *rain-gauge* ; of which all that can be said on the subject would be merely a repetition of what was justly said sixty years ago by Mr. Cavendish on a similar occasion (*Philosophical Transactions*, 1776), namely, " that, on the whole, the situation is not altogether such as could be wished, but is the *best* the house affords."

November 23, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair.

The following gentlemen were, by ballot, elected Auditors of the Treasurer's accounts, on the part of the Society, viz. John Frederick Daniell, Esq. ; Sir Philip Grey Egerton, Bart. ; Davies Gilbert, Esq. ; and Stephen Peter Rigaud, Esq.

Frederick William Mullins, Esq., was balloted for, but not elected into the Society.

"Magnetical Observations made in the West Indies, on the Coasts

of Brazil and North America, in the years 1834, 1835, 1836 and 1837." By Sir James Everard Home, Bart., Commander Royal Navy, F.R.S., the Observations reduced by the Rev. George Fisher, M.A., F.R.S.

The observations for the dip were made with an instrument of modern construction, by Dollond. Each observation consisted of an equal number of readings of the position of the needle, before and after the inversion of its poles, and a mean of all the readings taken for the true dip. Tables are subjoined, containing the dips observed at each place; the times of making a hundred vibrations of five horizontal needles, and the mean horizontal forces computed therefrom; and likewise the results estimated in the direction of the dipping needle, compared with direct experiments made with the dipping needle itself.

A paper was also read in part, entitled "On Low Fogs and Stationary Clouds." By William Kelly, M.D. Communicated by Capt. Beaufort, R.N., F.R.S.

November 30, 1837.

At the Anniversary Meeting of the Royal Society, Francis Baily, Esq., Vice-President and Treasurer, in the Chair,

The Chairman read a letter from His Royal Highness the President, expressing his regret that he was unable to be present at the Meeting, in consequence of his continuing to suffer from his recent accident.

Mr. Davies Gilbert, as one of the Auditors of the Treasurer's accounts on the part of the Society, reported the balance in the Treasurer's hands at the present Audit was three hundred and thirty-seven pounds three shillings and eight pence.

The Thanks of the Society were voted to the Auditors for their trouble in auditing the Treasurer's Accounts.

The following Lists of the Fellows admitted, and of those deceased during the past year, were read:

Deceased: on the Home List.—His Majesty *The King*; James Henry Arnold, Esq.; Count Barbiano Bolgioiso; the Rev. Joseph Batten; Samuel D. Broughton, Esq.; Henry Thomas Colebrooke, Esq.; Earl Cowper; John Davidson, Esq.; Alexander Duncan, Esq.; the Earl of Egremont; Cypriano Ribeiro Freire; Lord Glenlyon; Sir Thomas Hanmer, Bart.; George Hibbert, Esq.; Joseph Jekyll, Esq., M.A.; John Johnstone, M.D.; John Latham, M.D. (*Winchester*); the Marquess Malaspina de Sannazaro; Captain Z. Mudge, R.E.; the Rev. Robert Nixon, B.D.; Lewis Pinto de Souza Coutinho; the Rev. William Ritchie, LL.D.; the Rev. George Rowley, D.D.; Joseph Sabine, Esq.; Count de Salis; the Bishop of Salisbury; Sir John Soane, Knt.; Dr. Tiarks; Edward Turner, M.D.

On the Foreign List.—M. Adam Afzelius; M. Morichini.

Admitted: on the Home List.—William Ayrton, Esq.; Robert Bigsby, Esq.; Henry Boase, M.D.; John Burnet, Esq.; Benjamin

Bond Cabbell, Esq.; James Carson, M.D.; William Tierney Clark, Esq.; George Edward Frere, Esq.; Thomas Graham, Esq., M.A.; Charles Holland, M.D.; William Hopkins, Esq., M.A.; Robert Hunter, Esq.; James F. W. Johnston, Esq., M.A.; Richard Partridge, Esq.; Joseph Ellison Portlock, Esq.; John Urpath Rastick, Esq.; John Forbes Royle, M.D.; Frederic C. Skey, Esq.; John F. Smith, Esq.; Samuel Solly, Esq.; the Rev. William Walton; J. R. Wellsted, Esq.; Richard Westmacott, Esq.; William Archibald Armstrong White, Esq.; William Page Wood, Esq.

On the Foreign List.—M. Becquerel; Prof. Ehrenberg; Admiral von Krusenstern; Chevalier Mirbel.

The following Address of His Royal Highness the President to the present Meeting, was read from the Chair by the Chairman.

GENTLEMEN,

WHEN I last had the honour of addressing you from this Chair, I ventured to express a hope that the happy restoration of my sight, and the continued possession of health, would have enabled me to discharge, with becoming regularity, the duties of President of this Society during those portions of the year in which I am generally resident in London: the fulfilment, however, of that hope was unhappily frustrated by a long and dangerous illness, which confined me for several months to my apartments and from the effects of which I have hardly yet entirely recovered. I trust, Gentlemen, you will pardon me if I look forward with brighter hopes to the prospects of another year; and if I hesitate to regard the unhappy experience of that which is past as a premonition of the fate which awaits me in those which are to come; if such were my assurance or reasonable fear, I should acquiesce in the duty and propriety of at once retiring from this Chair and of no longer soliciting the renewal of an honour which I have enjoyed for so many years; but if it should be the pleasure of that good Providence, whose chastisements and whose mercies I have so often before experienced, to disable me from presiding over this Society in such a manner as might be considered necessary for the protection and maintenance of its just interests and dignity, I should bow with humble resignation to the expression of His will, and resign into other hands the discharge of those duties for which I should feel myself no longer qualified.

Since the last Annual Session of this Society we have lost, Gentlemen, a most munificent patron and benefactor, by the demise of our late most gracious Sovereign, King William the Fourth, of whom it is difficult for me to speak in terms which do justice to my feelings. He was, indeed, not less distinguished by the exalted station which he filled, than by the warmth and sincerity of his affections as a husband, a brother, and a friend; by the undisguised frankness and truth of his character as a man; and as a monarch, by his patriotic zeal to increase the efficiency and secure the permanence of the great institutions of his country and to extend to all classes of his subjects the blessings of peace and knowledge and the protection

of just and equal laws. I would gladly enlarge, if the time or the occasion would permit me to do so, upon these and many other virtues in the character of one who was so closely connected with me by the ties of relationship and of duty; but I am quite sure that I should fail in the expression both of your sentiments and my own, if I did not acknowledge, in becoming terms of respect and gratitude, the especial patronage and protection which he extended to the Royal Society, by the renewed grant of the two Annual Medals which had been instituted by his royal brother and predecessor, and by the enactment of such statutes for their distribution as appeared to him best calculated to stimulate the exertions of philosophers, and to associate for ever the results of their labours with the publication of the Transactions of the Royal Society.

The Council availed themselves of the earliest opportunity which the resumption of their meetings allowed, to present, in the name of the Fellows of the Royal Society, the homage of their loyalty and devotion to the person and throne of the illustrious Princess who now wields the sceptre of this great empire; and they ventured at the same time to express a hope that Her Majesty would be graciously pleased, in conformity with the practice of her predecessors, to sign her royal name in our Register as Patroness of our Society, and that she would likewise continue to us the annual grant of the two Medals which had been made by King George the Fourth and King William the Fourth.

This Address has been presented to Her Majesty, who has been graciously pleased to signify to me, through the Secretary of State, that she is most sensible of the loyalty and attachment expressed in it, and that she cordially joins in the wish of the Royal Society that her reign may be distinguished by the triumphs of the arts of peace and by the general diffusion and advancement of religion and knowledge amongst all classes of her subjects. Her Majesty was further graciously pleased to intimate that she would have great satisfaction in becoming the Patroness of the Royal Society, and that she would annually place at their disposal two Gold Medals, and would continue to extend to them the same protection and patronage which they had received from her royal predecessors.

I feel proud, Gentlemen, in being able to communicate to you these gracious assurances of support and protection from our Patroness and Queen, which are well calculated to confirm, though they cannot increase, the loyal and devoted attachment which we feel to her person; and I trust that I shall be able, at no distant period, to announce to you that Her Majesty has signed her royal name in our Register as Patroness of the Royal Society.

I now proceed to notice some of the more important events connected with the administration of the Royal Society during the last year.

One of the Royal Medals has been adjudged to Mr. Whewell for his very valuable series of researches on the tides, which have been published in our Transactions, chiefly during the last three years. I must refer you, Gentlemen, for a statement of the grounds upon

which this decision has been founded to the more detailed reports of the Council, which will be read to you by your Secretary Dr. Roget; but I gladly avail myself of this opportunity of expressing my respect for the great talents and varied attainments of the distinguished philosopher upon whom this mark of honour has been conferred. If I regard him as occupied with the highest and most important practical duties connected with our system of academical education, and in providing and arranging the materials by which it is conducted, or the principles upon which it should be based, he will be found in the foremost rank of those whose labours do not deserve the less honour because they commonly absorb the entire time and attention of those who are engaged in them, and thus close up the avenue to those distinctions which are almost exclusively confined to great discoveries in science, or to important productions in literature. When I read his essays on the architecture of the middle ages, on subjects of general literature, or on moral and metaphysical philosophy, exhibiting powers of mind so various in their application and so refined and cultivated in their character, I feel inclined to forget the profound historian of science in the accomplished man of letters, or the learned amateur of art; but it is in his last and highest vocation, whilst tracing the causes which have advanced or checked the progress of the inductive sciences from the first dawn of philosophy in Greece to their mature development in the nineteenth century, or in pointing out the marks of design of an all-wise and all-powerful Providence in the greatest of those works and operations of nature which our senses or our knowledge can comprehend or explain, that I recognise the productions of one of those superior minds which are accustomed to exercise a powerful and lasting influence upon the intellectual character and speculations of the age in which they flourish.

It is now three years since the Royal Medal was adjudged to Mr. Lubbock for his *Researches on the Tides*; and the Council have availed themselves of the first opportunity which was presented by the recurrence of the cycle of the subjects, which are successively entitled to the Royal Medals, to make a similar award to his colleague and fellow-labourer in this very interesting and important series of investigations. It is not for me to attempt to balance the relative claims and merits, in connection with this subject, of these two very eminent philosophers; it is quite sufficient to remark that the first who ventured to approach this difficult and long-neglected inquiry was the first also who was selected for honour: but I have long noticed with equal pride and satisfaction the perfect harmony with which they have carried on their co-ordinate labours, apparently indifferent to every object but the attainment of truth, and altogether superior to those jealousies which too frequently present themselves amongst rival and cotemporaneous labourers in the same departments of science.

I regret to observe that the second Royal Medal for the present year has not been awarded, and that it has consequently lapsed to the Executors of his late Majesty. It was proposed that it should be

given to the best Memoir presented to the Royal Society between the years 1834 and 1837, containing "Contributions towards a System of Geological Chronology, founded upon an examination of Fossil Remains and their attendant Phænomena;" a subject of the greatest interest, and also of the greatest delicacy, from its connexion with those agitating topics which the speculations of philosophers are compelled to approach, though they may not always venture to decide. I should have rejoiced to have seen in the Transactions of the Royal Society a record of the opinions of a Buckland or a Sedgwick upon a theme which is so worthy of the application of their highest powers; and I trust that, though its announcement as a Prize Question has failed to secure, within the prescribed period, the accomplishment of the object proposed by it, it will still have done some service to the cause of science by exciting the attention of geologists in such a manner as may sooner or later lead to a definite and philosophical exposition of their views on a subject of so much importance.

Those who have attended to the Tidal researches of Mr. Whewell must be aware how much light has been thrown upon the character and course of the phænomena of the tides by the simultaneous observations, under his instructions, which were made in the month of June, 1834 and 1835, at nearly five hundred stations of the Coast Guard Service in Great Britain and Ireland, and simultaneously with the latter also at more than one hundred stations in America, Spain, Portugal, France, Belgium, Holland, Denmark, and Norway. These observations were undertaken by the authority or through the influence of the Government of this country, which likewise most promptly and liberally furnished the requisite funds and assistance for reducing the observations in such a manner as was requisite for deducing general conclusions from them, a labour much too extensive and costly to be undertaken by any single individual. I gladly seize this opportunity of bearing testimony, occupying as I do the highest scientific station in this country, to the readiness which the Lords of the Treasury and the Admiralty have shown on this and on every other occasion to forward scientific inquiries, and particularly such as are connected with the advancement of astronomy and navigation. They have granted funds for reducing and publishing the Planetary Observations at Greenwich, the valuable and extensive series of observations of the late Mr. Groombridge, for repeating upon an adequate scale the very important experiments of Mr. Cavendish, and for many other subjects of great scientific interest and value; and I feel satisfied that every application for assistance towards the accomplishment of any important object in science, will receive from them the most willing attention and support, if it comes before them with the recommendation and authority of those persons who are most competent to judge of its usefulness or necessity, and in such a form as may justify them in appealing to Parliament for its sanction of the requisite expenditure. I rejoice, Gentlemen, in such manifestations of the sympathy of the Government of this great

country for the progress of science, and I trust that its influence will be felt in the cordial union and co-operation of philosophers in planning and in executing those great systems of observations, whether simultaneous or not, which are still requisite to fill up some of those blank spaces which occupy so large a portion in the map of human knowledge.

In the course of last year the celebrated Baron de Humboldt addressed a letter to me, as President of the Royal Society, expressing a wish that Magnetical Observatories, upon a uniform plan, might be established in this country and its colonies, with a view of making simultaneous observations with those which are now making, or which are in progress to be made, in different parts of the continent of Europe and of Northern Asia. I felt it to be due to the illustrious author of this communication to make it generally known to the Fellows of the Royal Society, and to beg that a committee of the Council might be appointed to consider the best mode of carrying its recommendations into effect. A very elaborate Report was consequently made by the Astronomer Royal and Mr. Christie in November last, enumerating many important consequences which might result from such a system of observations, and pointing out a series of stations where they might most efficiently be made. I am happy to inform you, Gentlemen, that measures are in progress for the accomplishment of all these objects: a Magnetical Observatory, which was long contemplated and earnestly recommended by the Board of Visitors of the Royal Observatory, has been established at Greenwich, in a situation so remote from all other buildings as to be altogether free even from the suspicion of external disturbances. The Corps of Royal Engineers, which has always been distinguished for the zeal and scientific acquirements of many of its Members, has spontaneously offered to conduct the requisite observations, in whatever quarter of the globe they may be stationed; the Astronomer Royal has determined the species of observations to be made, and the character and construction of the instruments to be used; and the Lords of the Treasury have placed at the disposal of the Royal Society the requisite funds for their purchase. I have felt it my duty, Gentlemen, to bring these circumstances under your notice, not merely as forming an important part of the proceedings of the Council of the Royal Society during the last year, but as an encouraging and instructive example of the facility with which extensive co-operation and assistance may be obtained in the execution of any scientific object, however extensive it may be, when the practical means for performing it are distinctly and clearly defined.

It is with real concern that I venture to call your attention to a letter which has been recently published, on the subject of the new Catalogue of the Library of the Royal Society, which I somewhat prematurely announced, when I last had the honour of addressing you, as preparing for publication, and as likely very shortly to appear. I was perfectly aware, when I made that announcement to you, of the nature of the correspondence which had passed between Mr. Panizzi and the Council relating to this Catalogue; but I had

no suspicion that the very brief allusion which I made to this subject, or the incidental mention of Mr. Panizzi's name, which I made in no offensive or disrespectful sense, would have been considered sufficient ground for its publication. It is not my intention to make any observations on the particular allegations which are made against the Council, both collectively and individually, in Mr. Panizzi's letter, which will be more properly noticed in a short statement, which has been drawn up, in deference to your good opinion, by the Council, and which will be read to you by Dr. Roget*; but I think it my duty to state to you, that I was not only cognisant of the whole course of the proceedings of the Council at the time when they took place, but that I perfectly concurred in their propriety; and I beg leave further to assure you, that a careful perusal of Mr. Panizzi's correspondence with the Council, of his comments upon their resolutions and of his imputations upon their conduct, has in no respect tended to modify the opinion which I originally formed, or to induce me to withdraw from the full share of responsibility which I incur, in connection with these proceedings, in common with every other Member of the Council.

Before I conclude this portion of my address, I feel it to be my duty to notice the retirement of Mr. Children and Mr. König from the offices which they have so long and so ably filled. The increasing duties, which have been imposed upon them by recent regulations at the British Museum, have been deemed by them in some degree incompatible with those which they owe to the Royal Society; and they have determined therefore, with a promptitude and delicacy of feeling which does them honour, to retire from their official connexion with us. It is quite unnecessary for me to enlarge upon the merits of two gentlemen who are so well known to you by their labours in your service, by the courtesy of their manners and by the extent and variety of their acquirements; but I should do injustice to my own feelings if I did not express, in the strongest terms, my personal obligations to them for their kind attention to my wishes, and for the anxiety which they have always shown that the interests of the Royal Society should not suffer from my occasional inability to attend personally to the discharge of the duties of my office. I am quite sure, Gentlemen, that I do not misinterpret your feelings, when I propose to thank them, in your name and my own, for their long and valuable services.

The Society has lost during the last year twenty-nine Members on the Home, and two on the Foreign List, and I shall now proceed to notice some of the most distinguished names which appear amongst them.

Henry Thomas Colebrooke was the son of Sir George Colebrooke, an eminent Director of the East India Company, under whose auspices he proceeded to India, as a writer, in 1782. Though a severe student in youth, and strongly disposed to follow a learned profession at home, he gave no indications for many years after his

* This statement is given in page 18.

arrival in India of those tastes for severe and abstract studies for which he was afterwards so celebrated; and we consequently find that, whilst resident at Purneah, he devoted much of his time to the wild and animating field-sports of the East, for which he long retained a passionate fondness. He made his first appearance as an author in 1792, in a Treatise on the Agriculture and Commerce of Bengal; and it was about this period that he began, with all the ardour and energy which distinguished his character, the study of the Sanscrit language, chiefly with a view to acquire a knowledge of the *Lilawati* and other Sanscrit treatises on Algebra and Astronomy, which the somewhat extravagant speculations of Bailly and others had begun to bring into notice. He subsequently undertook the translation of the Digest of the Hindu Laws of Contracts and Successions, which had been compiled under the direction of Sir William Jones, a most laborious and difficult task, which he completed in less than two years. It was during his engagement on this work that he was appointed to a judicial situation at Mirzapore, a position singularly suited to his tastes and pursuits, from its vicinity to Benares, the great repository of the ancient treasures of the literature of Hindostan, and the place of residence of its most learned expounders.

In the year 1800 he was removed to Calcutta, and raised to the highest judicial situation in the native courts of India, at the same time that he was made President of the Board of Revenue, Member of the Supreme Council, and Honorary Professor of Sanscrit in the College of Fort William. But the important official duties which he was thus called upon to discharge seem rather to have stimulated, than to have checked, his labours and investigations in oriental literature and oriental science. In the course of a few years there appeared from his pen many profound dissertations in the Asiatic Researches, on the Vedanta System of Philosophy, on Sanscrit and Pracrit Poetry and Grammar, on the Indian Classes, on the Origin and Tenets of the Mahometan Sects, on the Jains, on the Indian and Arabian Division of the Signs of the Zodiac, and on the Notions of the Hindu Astronomers on the Precession of the Equinoxes and the Motions of the Planets; to which must be added the first volume of a very elaborate Sanscrit Grammar, the translation of the *Peostrá*, a Sanscrit Dictionary, and two extensive Treatises on the Hindu Law of Inheritance, together with editions of the *Amera Cosha*, a Sanscrit Vocabulary, and of the *Hitópadesá*, or "Salutary Instruction", which had been translated by Mr. Wilkins, and which is more commonly known under the name of the "Fables of Pilpay".

It was some time after Mr. Colebrooke's return to this country that he published, in 1817, a translation of the *Lilawati* and *Vijaganita*, Sanscrit treatises on arithmetic, algebra and mensuration, to which was prefixed a dissertation on the early history of algebra and arithmetic in India, Arabia and Italy, which is equally remarkable for its profound knowledge of Hindu and Arabian literature and its correct views of the relations of oriental and ancient and mo-

dern European science. He was also the first person who maintained, from his own observations on the plains of Hindostan, the superior elevation of the Himalayan mountains above the Andes of America, in opposition to the opinions generally entertained at that period, and which had been sanctioned by the great authority of Humboldt's theory of the range of the curve of perpetual congelation. The complete confirmation which his opinion afterwards received, from accurate barometrical and trigonometrical measurements, was always referred to, in his later years, with particular satisfaction and triumph.

Mr. Colebrooke continued the steady pursuit of his oriental and scientific studies until nearly the close of his life, and even when the progress of his infirmities confined him almost entirely to his bed. He was one of the founders of the Asiatic and Astronomical Societies, and a short time before his death he gave to the library of the India House his incomparable collection of Sanscrit and Asiatic manuscripts, which had been collected at an expense of nearly 10,000*l.*, with the noble view of preserving them for ever from the danger of dispersion by the fluctuating accidents of inheritance.

Mr. Colebrooke was probably, with one single exception, the greatest Sanscrit scholar of his age; and when we take into account his great acquirements in mathematics and philosophy and in almost every branch of literature, combined with the most accurate and severe judgement, and also his great public services in situations of the highest trust and responsibility, we shall not hesitate to pronounce him one of the most illustrious of that extraordinary succession of great men who have adorned the annals of our Indian empire, the deaths of so many of whom it has been my misfortune to record in my recent addresses from this chair.

Dr. John Latham reached the extraordinary age of ninety-seven years, having enjoyed the full possession of his faculties and almost unbroken health until within a few days of his death: he was the father of the Royal and Antiquarian Societies, and it is sixty-seven years since his first paper, on a medical subject, was published in our Transactions. He was the author of many papers on antiquarian subjects; but his favourite study throughout life was natural history, and particularly ornithology. He published, in 1781, his General Synopsis of Birds, in six volumes quarto, and afterwards two supplementary volumes. In 1792 he published his Index Ornithologicus, a complete system of ornithology, arranged in classes, orders, genera and species, in two volumes quarto. At the age of 82, he commenced his General History of Birds, a magnificent work in eleven volumes quarto. He was a man of very systematic habits and most amiable character, the tranquil course of whose long life was neither disturbed by scientific or professional jealousies, nor embittered by the want of those enjoyments which competence and domestic happiness and virtue alone can confer.

Dr. Tiarks was born at Jever in Oldenburg, and came to England in 1810, when he was appointed Assistant-Librarian to Sir Joseph Banks, through whose influence he was nominated Astronomer to the Commission for settling the North American Boundary, under

the authority of the Treaty of Ghent. After his return to England, in 1822, he was commissioned by the Admiralty, at the request of the Board of Longitude, to ascertain, by means of a great number of chronometers, the difference of the longitudes of Falmouth and Madeira, and subsequently of Falmouth and Dover, the results of which were detailed in a very able paper in our Transactions for 1824, in which he pointed out and explained the origin of an error of nearly 4" of time in the longitudes of all the stations of the Trigonometrical Survey. He was afterwards sent on a similar mission to Heligoland and various stations in the North Seas, and on the last occasion he was accompanied by Sir Humphry Davy, who wished to try the effect of his protectors on the corrosion of the copper sheathing of ships. In 1825 he was recalled from Germany to resume his astronomical surveys in America, where he was employed to ascertain the position and extent of the north-western boundary of the Lake of the Woods, an operation in the execution of which both he and the party who assisted him suffered the greatest hardships and privations. He published various reports of his surveys, and was necessarily much employed and consulted in the difficult and embarrassing negotiations which have attended, and unhappily still attend, the settlement of the important question of the North American boundaries. Dr. Tiarks died in the forty-eighth year of age, at his native place, in consequence of a fever which attacked a constitution already shattered and broken by the severe labours and privations which he had endured. He was a mathematician of no inconsiderable attainments, a very careful and efficient practical astronomer, and admirably qualified for the very important and responsible duties which he was appointed to discharge.

Dr. Edward Turner was a native of Jamaica, and studied medicine at Edinburgh, and chemistry at Göttingen under the instructions of the celebrated analytic chemist Stromeyer. He became a lecturer on chemistry at Edinburgh in 1824, and his first publication was a short introduction to the study of the laws of chemical combination and the atomic theory. He obtained the Professorship of Chemistry in the London University at its first establishment in 1828, a situation which he continued to hold to the end of his life. His *Elements of Chemistry* have enjoyed an uncommon degree of popularity, and are remarkable for clearness and precision both in the description of his experiments and in the deduction of his theory. He was the author of two papers in our Transactions; the first "On the Composition of the Chloride of Barium," and the second containing "Researches on Atomic Weights," both written with a view of impugning the theory which had been promulgated by some English chemists of high authority, "that all atomic weights are simple multiples of that of hydrogen." In the year 1835 Dr. Turner was compelled by the declining state of his health to suspend all original researches, confining himself simply to the duties of his professorship, and he died in February last, in the fortieth year of his age, to the deep regret of every friend of the progress of chemi-

cal science. He was a person of most engaging manners and appearance and of most amiable character; and his body was followed to the grave, with every manifestation of respect and affectionate attachment, by the whole body of the pupils and professors of the institution of which he had so long been a principal ornament.

Dr. William Ritchie was originally Rector of the Royal Academy of Tain in Inverness-shire, where he contrived, by extreme frugality, to save a sufficient sum from his very small annual stipend to attend a course of the lectures of Thenard, Gay-Lussac, and Biot at Paris, and also to provide a substitute for the performance of his duties during his temporary absence from Scotland. His skill and originality in devising and performing experiments with the most simple materials, in illustration of various disputed points of natural philosophy, attracted the attention of the distinguished philosophers whose occasional pupil he had become: he had also communicated, through Sir John Herschel, who took a strong interest in his fortunes, to the Royal Society, papers "On a new Photometer," "On a new form of the Differential Thermometer," and "On the Permeability of transparent Screens of extreme tenuity by Radiant Heat," which led to his appointment, through the recommendation of Major Sabine, to the Professorship of Natural Philosophy at the Royal Institution, where he delivered a course of probationary lectures in the spring of 1829: he became, from this time, a permanent resident in London, and was appointed to the Professorship of Natural Philosophy at the London University in 1832. He subsequently communicated to the Royal Society, papers "On the Elasticity of Threads of Glass, and the application of this property to Torsion Balances;" and also various experimental researches on the electric and chemical theories of galvanism, on electro-magnetism and voltaic electricity, which are more remarkable for the practical ingenuity manifested in the contrivance and execution of the experiments, than for the influence of the views which they display on the progress of their theory, which was so fully and so happily developed by the cotemporary labours of another illustrious chemist and philosopher. Dr. Ritchie was subsequently engaged in experiments, on an extensive scale, on the manufacture of glass for optical purposes, for the examination of the results of which a Commission was appointed by the Government, with a view to their further prosecution by a public grant of money, or by affording increased facilities of experiment by a relaxation of the regulations of the Excise. A telescope of 8 inches aperture was made by Mr. Dollond from Dr. Ritchie's glass, at the recommendation of this commission; but it is generally understood that its performance was not so satisfactory as to sanction a further expenditure in the extension of these experiments. Dr. Ritchie died in the autumn of the present year, of a fever caught in Scotland; and though the traces of an imperfect and irregular education are but too manifest in most of his theoretical researches, yet he must always be regarded as an experimenter of great ingenuity and merit, and as a remarkable example of the acquisition of a very extensive knowledge of philosophy under difficulties and privations.

which would have arrested the progress of any person of less ardour and determination of character.

Mr. Joseph Sabine was educated in the University of Dublin, and devoted himself, from a very early period of life, to the study of botany, ornithology, and other branches of natural history, to the neglect of those professional studies which his friends designed him to pursue. One of his earliest labours was the formation of a collection of British birds of almost unrivalled extent and completeness. He became secretary to the Horticultural Society at the period of its first establishment; and though his connection with it was afterwards very abruptly and perhaps very harshly terminated, he must always be considered as the chief author of its successful and complete development. To the Horticultural Transactions he contributed 64 papers, the most important of which are those on the genera *Crocus*, *Dahlia*, and *Chrysanthemum*; and he was also required to re-write the greatest part of the communications which were addressed to the Society by gardeners and practical men, which were rarely sent in a fit state for publication, but which frequently embodied very important information on the various processes of horticulture.

Mr. Sabine was likewise an active and valuable member of the Zoological Society, whose gardens are chiefly indebted to his taste and knowledge for the introduction and systematic arrangement of those splendid flowers and shrubs which have added so greatly to their beauty and interest.

Mr. Sabine held, for the greatest part of his life, the situation of Inspector-General of Taxes, and was called upon by his official duties to make periodical visits to almost every part of the kingdom; he never omitted any opportunity which his various journeys afforded him, of acquiring or of communicating practical knowledge of horticulture and of botany; and few persons have contributed so much, by their personal exertions, to add to the decorations of the cottage and the park, to increase and improve the produce of our gardens, and thus greatly to extend the sphere of the innocent enjoyments and luxuries of all classes of society.

The Rev. Dr. Joseph Hallett Batten was a native of Penzance in Cornwall, and was elected a Fellow of Trinity College, Cambridge, in 1801, after attaining very high academical honours. He was appointed Classical Professor at the East India College at Hayleybury at the period of its first establishment, and became Principal of the college upon the retirement of Dr. Henley, a situation which he continued to retain until within a month of his death. He was a man of cultivated taste and of very extensive attainments, both in theology and general literature; and in every way worthy, by his intellectual powers and character, of presiding over an establishment which has been so justly distinguished by the very eminent men who have been, and now are, connected with it.

Dr. John Johnstone was the sixth son of the celebrated Dr. James Johnstone of Worcester, and received his education at Merton College, Oxford. He was for upwards of forty years a very distin-

guished physician at Birmingham and its neighbourhood, and made his first appearance as an author in a defence of his father's claim to the first discovery of the disinfecting powers of muriatic acid gas, which had been claimed by Dr. Carmichael Smyth. Though earnestly attached to the study and practice of his profession, he retained throughout life a fondness for classical literature, and lived on the most intimate terms with some of the most distinguished scholars of the age, including amongst their number the justly celebrated Dr. Parr, whose life and voluminous correspondence he published, a work full of interesting literary anecdote and classical research; and his Harveian oration, pronounced in 1819, and which has been recently published, with a short memoir of his life, by his friend the Bishop of Lichfield, is a model of spirited and correct Latinity. Dr. Johnstone was a man of very warm affections and of great independence of character, and he was universally respected in the great manufacturing city in which he resided, for his great professional skill and services, and for the active support which he gave to every benevolent and useful institution.

Sir John Soane received his early architectural education under Mr. Dance and Mr. D. Holland, and was afterwards sent, by the especial bounty of King George the Third, as a student of the Royal Academy, to pursue his professional studies at Rome. After his return he gradually obtained extensive employment, both as an architect and a surveyor, and finally succeeded in securing almost every important and honourable appointment which is connected with the exercise of his profession in this country. In later life, when in possession of an ample fortune and public honours, he became a most munificent patron of public institutions, and more particularly of those which are connected with the advancement of the fine arts; and in 1835 he bequeathed his house in Lincoln's Inn Fields, and the magnificent collection of works of art which it contained, to the nation, and secured the accomplishment of this noble project by an Act of Parliament; he continued to pursue his usual course of public munificence until his death, which took place on the 20th of January last, in the 84th year of his age.

Sir John Soane was profoundly acquainted with the great principles of his art, and many of the interiors as well as exteriors of his buildings are remarkable for skilful construction and for rich and harmonious effects; but he was unfortunately disposed, in some cases, to seek for novelty rather in new forms and decorations of architectural members, than for originality in the combination of those which have been sanctioned by the concurrent voice of the most cultivated of ancient nations and the greatest masters of modern art; it is for this reason that many of his works appear somewhat capricious and extravagant, and fail to produce that undefinable feeling of pleasure and satisfaction which always attends the contemplation of those great productions of architecture which have been celebrated for correct proportions, or for beautiful and appropriate decoration.

In connexion with this distinguished professor and patron of art,

I feel myself called upon to allude to the name of the venerable Earl of Egremont, whose very recent loss we have to deplore. He was a nobleman distinguished by his active yet discriminating benevolence, and by his princely use of a princely fortune; but it is as a judge and patron of art that his loss will be most severely felt beyond the precincts of his own family and the numerous poor who were the immediate partakers of his bounty. He was equally judicious in the selection of subjects for artists to execute, and liberal in rewarding them when done.

Mr. J. D. Broughton, Surgeon of the Life Guards, had served with great distinction as a medical officer during a great part of the Peninsular war and at Waterloo. He was an eminent physiologist, and devoted a great portion of his time and attention to the study and improvement of the science of medical jurisprudence, and more particularly to experiments on the effects of poisons, and to the best and most unerring tests for detecting their presence after death. His death, which followed a serious operation, rendered necessary by a long-neglected accident, was deeply lamented by a large circle of friends, by whom he was equally respected and beloved for his great professional talents and for his honourable character.

Mr. John Davidson, the last known victim to the cause of African discovery, was formerly a partner in the house of Messrs. Savory and Moore, the well-known chemists, but was induced to quit it in 1826, partly with a view to gratify his passion for foreign travel, and partly from other causes. He afterwards visited North and South America, India, Palestine, Turkey, Greece, Italy, Germany, and France; and the lectures which he gave at the Royal Institution and elsewhere, after his return, on the pyramids of Memphis and Mexico, on Thebes and the temples of Egypt and Jerusalem, afforded a sufficient proof both of his activity and of his accurate observation. The spirit of enterprise and travels, when once excited, is not easily allayed, and Mr. Davidson devoted himself, almost from the period of his return to this country, to a course of preparation for a journey to Timbuctoo, which had already proved fatal to so many adventurers. He was accompanied on this journey by Abu-Bekr, an enfranchised African slave, who had been a prince in his own country when young, and was well acquainted with the Arabic language. He had penetrated from Wadnoon to within twenty-five days' journey of Timbuctoo, when he was murdered by the El Hareb tribe, who were suspected to have been hired for that purpose by Moorish merchants, who, from not being able to understand or conceive the real motives of such an undertaking, conceived that its success would be injurious to their interests. Mr. Davidson was a man of great activity and strength, in the full vigour of life and health, and able to endure the severest labours and privations; but personal accomplishments the most calculated to secure success in ordinary attempts of this nature, serve only to augment the suspicion and to stimulate the cruelty of those savage tribes, who tyrannize over these inhospitable and almost impenetrable regions, and who are described by his companion, Abu-Bekr, "as

full of envy at a stranger's goods; they lie in wait to plunder him of every thing, as a lion lieth in wait for the cattle; they have no mercy on the stranger; even if a stranger were to strip off his skin and to give it to them, they would seize upon it."

The only Foreign Members whom the Society has lost during the last year are Dr. Adam Afzelius, of Upsala, and Professor Morichini, of Rome.

Dr. Adam Afzelius was born at Larg in West Gothland in 1750, and was one of the last surviving pupils of Linnæus. In 1777 he was appointed Reader of Oriental Literature and in 1785 Demonstrator of Botany in the University of Upsala, and he made his first appearance as an author by the publication of a short supplement to the *Flora Suecica* of his master, in the Transactions of the Academy of Stockholm for 1787. In the years 1792 and 1794, he made botanical expeditions to Guinea and Sierra Leone, and a considerable part of the collections which he formed in those countries passed subsequently into the herbariums of Sir Joseph Banks and Sir James Edward Smith. In 1797 he was made Secretary of Legation to the Swedish Embassy in this country, and in the following year he was elected a Foreign Member of the Royal Society on the ground of his great knowledge of botany and zoology. Upon his return to his own country, he became Professor of Materia Medica and Diætics, at Upsala, situations which he retained for the remainder of his life. He was the author of a learned paper in the Linnean Transactions for 1791 on the genus *Trifolium*, and also of two works entitled *Remedia Guinensia* and *Stirpium in Guinea medicinalium species*: he edited likewise the botanical Correspondence of Linnæus. He was a botanist of great learning and acquirements, and highly esteemed by the leading founders of the Linnean Society; but I am unable to connect his name with any considerable advancement in natural knowledge.

Professor Morichini, of Rome, was elected a Foreign Member of the Royal Society in 1827, and is chiefly known for his experiment on the magnetizing influence of the violet rays in the solar spectrum. His experiment was repeated by Configliachi at Pavia, and by Berard at Montpellier, without success, and in consequence doubts were expressed of the accuracy of his results, which appeared to be finally removed by the successful repetition of it by our justly celebrated countrywoman Mrs. Somerville, in the summer of 1825. I am not aware however that any other philosopher has succeeded in a similar attempt.

Statement of the Council relative to Mr. Panizzi's Pamphlet.

In the pamphlet recently published by Mr. Panizzi, entitled "A Letter to His Royal Highness the President of the Royal Society, on the New Catalogue of the Library of that Institution now in the press," all the charges brought forward against the Council are founded on the most unwarranted and erroneous assumptions.

Mr. Panizzi, assumes, in the first place, that the Council was bound to pay him *in advance* the remuneration agreed upon for the completion of the Catalogue; such payment in advance never having been for a moment contemplated. His payment was to have been at the rate of £30 for every thousand titles the Catalogue might contain; but, in consideration that the work would probably require a long time to accomplish, it was agreed that one third of the money should be given to him when he had written out all the titles on slips of paper, another third when the revises were finally corrected for the press, and the remaining third when the whole was printed off. The total number of titles written out by Mr. Panizzi, as counted by Mr. Shuckard, by whose computation he consented to abide, was found to be 24,136; which at the rate of £10 per thousand, would render the sum he ought to have received at the present stage of his work, £241 : 7s. 2d., but from this sum £27 : 6s. is to be deducted in payment of Mr. Robertson, as had been agreed to by Mr. Panizzi, reducing it to £214 : 1s. 2d. At the period when Mr. Panizzi discontinued the work he had already received from the Society £450 *on account*, which is more than double the sum to which he was then strictly entitled. The Council, therefore, far from imagining that he had any further claims on the Society, considered that in advancing him so large a sum before he had completed the second term of his engagement, they had rather erred on the side of liberality. They could never have had an idea that he expected any additional payment, as he never gave them the slightest intimation to that effect; and it is not until after the lapse of sixteen months that he suddenly makes an appeal, not to the Council of the Royal Society, but to the public, by the circulation of a pamphlet, claiming further remuneration, which he has never applied for to the party from whom he imagines it to be due.

In the second place, Mr. Panizzi assumes that the slips and revises are his own property, and that the Council has no right to them; and to such a length does he carry this notion, that, even after he had ceased to be employed by the Council, he refused to give up the key of the drawers containing the slips, as if that key were his own property. He likewise still withholds the revises containing the remarks of the Members who had seen them, alleging, while accused by nobody, that they were necessary for his justification. He is evidently not warranted in complaining of Members pointing out what appeared to them to be errors, for if he had deemed this wrong he would not have done the very same thing in his pamphlet, wherein he subjects the sheets of a former Catalogue, not designed for publication and in a very rough and unfinished state, to the ordeal of his severest criticism.

Another of Mr. Panizzi's unwarranted assumptions is his fancying himself at liberty to execute the work on which he was employed in whatever manner he pleased. The Council certainly never delegated to him this power; but appointed a Committee for the express purpose of superintending the work as it proceeded, and of regulating the manner in which it should be printed: and it was the

duty of Mr. Panizzi, or whoever else might have been employed by the Council, to follow the directions and instructions which might from time to time be given to him by that Committee.

Mr. Panizzi was continually complaining of ill usage, while he at the same time did not disclose the nature of his supposed injuries. He stated that he could not proceed with the work, but would not point out any ground of complaint. When requested to explain wherein he thought himself aggrieved, he would give no definite answer to the inquiry, but proposed to refer matters to an arbitration; leaving the Council all the while unacquainted with the subjects of dispute, or with the points to be settled by such arbitration. When, for the purpose of mutual understanding, he was invited to a conference with the Committee, he refused to meet them, and would only communicate by letter with the Council*.

Finding, at length, that the great cause of the offence taken by Mr. Panizzi consisted in his being directed by the Committee to omit certain comments and notes which he had introduced, in his own name, in the Catalogue, the Council, in deference to his wishes, and in the spirit of conciliation, conceded the point in dispute, and agreed that he might consider the manuscript corrections made by the members of the Committee, merely "as suggestions for his guidance." But, far from meeting them in the same spirit, he next required of the Council, as a condition without which he could not proceed with the Catalogue, a further concession, namely, that they should rescind the whole resolution of its Committee, and declare it null and void. It was obviously impossible to comply with so unreasonable a demand, which seemed so like a mere pretext for the total abandonment of the work: and no alternative remained but to pass the resolution of the 14th July, "that Mr. Panizzi be no longer employed in the formation of the Catalogue."

On the Council requesting the return of the revises in his possession, Mr. Panizzi refused to do so, alleging that they are his private property; nor would he even deliver up the key of the drawers containing the manuscript slips; refusals which, of course, put an end to all further correspondence with him on the part of the Council.

So far from the Council having ever withheld from Mr. Panizzi, as he asserts in his pamphlet they have done, the precise number of titles which he wrote for the Catalogue, they have always been ready to afford him that information. The slips were carefully counted by Mr. Shuckard, in whose accuracy Mr. Panizzi placed the fullest reliance, and who was appointed for that purpose with

* *Note by Mr. Baily.*—Mr. Panizzi having stated in his letter to the Secretary, of July 8th (see his pamphlet, page 38) that "Mr. Baily took away my written memorandum, and ordered Mr. Robertson not to take any step," I beg to remark, first, that, *when that letter was read* at the Council, I was surprised at the assertion, and distinctly denied the fact, never having seen nor heard of the written memorandum therein referred to: secondly, that Mr. Robertson was immediately called before the Council, and, on being questioned as to this subject, disclaimed also any knowledge of the circumstance.—FRANCIS BAILY.

his concurrence. Any inquiry that Mr. Panizzi might have chosen to make as to the results and details of that computation would, at all times, have received the most immediate and complete answer.

Report of the Proceedings of the Council for the past year.

The principal business of public interest which has occupied the attention of the Council relates to the extension of accurate magnetical and meteorological observations in different parts of the world.

A communication having been made by Lieut. William Denison, of the Royal Engineers, of a proposal from General Mulcaster, Inspector-General of Fortifications, that the officers of engineers generally should be employed, under the direction of the Royal Society, in promoting the advancement of science, by carrying on connected series of observations relating to Natural History, Meteorology, Magnetism, and other branches of physical science, and suggesting an application to Government for a grant of funds necessary for effecting so desirable an object; a Committee was appointed to consider of the proposed measure, and of the means of carrying into effect the recommendations contained in the letter of Baron Von Humboldt, addressed in April last to His Royal Highness the President. Conformably with the report made by this Committee, the Council fixed on the ten following places, namely, Gibraltar, Corfu, Ceylon, Hobart Town, Jamaica, Barbadoes, Newfoundland, Toronto, Bagdad, and the Cape of Good Hope, as being the most eligible for carrying on magnetic observations according to the plan recommended by Baron Von Humboldt; those places being permanent stations, where officers of engineers and clerks are always to be found. The Council also determined that, for the present, the observations of magnetism may be limited to those of the direction of the magnetic needle, and the meteorological observations restricted to those made on the four days, and in the manner recommended in Sir John Herschel's instructions.

A grant of 500*l.* from the public funds has since been obtained from the Lords Commissioners of Her Majesty's Treasury, in aid of the purchase of the necessary instruments for carrying on the magnetic observations, according to the plan proposed by the Committee, and under the directions of the Royal Society.

A statement having been also laid before the Council by Mr. Christie of the importance of a more accurate determination than has hitherto been made of the variation of the magnetic needle at several points on the coasts and in the interior of Great Britain and Ireland, and likewise of the dip and of the intensity of terrestrial magnetism, the Council, fully concurring in these views, presented to the Lords of the Admiralty a strong recommendation that steps should be taken for carrying into effect the course of observations pointed out by Mr. Christie; and their Lordships have in consequence appointed a Committee to meet and examine into this important subject.

The Council having deemed it desirable that the difference of level

between the brass mark fixed by Capt. Lloyd on the north-east landing stairs of the New London Bridge, and Mr. Bevan's mark on the basement of the pilasters of the north-east landing stairs of Waterloo Bridge, should be accurately determined, requested Sir John Rennie to undertake this determination. Sir John Rennie has reported to the Council that, after repeated trials, the greatest variation of which did not exceed two-tenths of an inch, he found that the mark on Waterloo Bridge is 3 feet and 1.65 inches above that on New London Bridge.

The Council have awarded the Copley Medal of this year to M. Becquerel for his various Memoirs on the subject of Electricity, published in the "*Mémoires de l'Académie Royale des Sciences de l'Institut de France*", and particularly for those on the production of Crystals of Metallic Sulphurets and of Sulphur, by the long-continued action of electricity of very low tension, and published in the tenth volume of those Memoirs.

Among those who have been engaged in investigating the phenomena of electricity, M. Becquerel holds an eminent rank, and the Memoirs of the Royal Academy of Sciences of Paris bear ample testimony to the success which has attended his researches in this department of science. He appears early to have been sensible that, for the detection of phenomena which may occur at the instant of incipient molecular attraction, and which become masked by the more general effect of the transfer of the elements when powerful electric currents are employed, it was necessary to substitute for these currents of very low tension*. Following out this view, carefully adjusting the strength of the current to the power of the affinities brought into action, he succeeded, by electric decomposition, and by subsequent recombination of the elements, in obtaining crystals of some of the metallic sulphurets, of sulphur, of the iodurets of lead and copper, of the insoluble sulphates of lime and barytes, of the carbonate of lead, and other substances, a few of which had previously, by other means, been obtained crystallized, but of which the great majority had only been recomposed in an amorphous state. In the Memoirs to which the Council have particularly adverted in the award of the Copley Medal to M. Becquerel, he had especially in view to explain, by the agency of electricity of very low tension, continued for an indefinite time, the occurrence of crystallized substances in mineral veins. The success with which his experiments were crowned in obtaining by such means crystals of the metallic sulphurets and of other substances, perfectly resembling those found abundantly in mineral veins, is favourable to the correctness of the views he had entertained; and these views derive additional support from the results obtained by others, in perfect accordance with his own, by means differing from those he employed, but involving precisely the same principles. Mr. Fox, in his experiments, which appear to have been

* *Annales de Chimie*, tome xxxiv. p. 152. *Mémoire lu à l'Académie Royale des Sciences, &c.*, 21 Aout, 1826.

conducted on a larger scale than those of M. Becquerel, endeavoured more closely to imitate the arrangements of nature, by introducing, between the substances acted on, walls of clay, in imitation of the "flucan courses" in the Cornish mines; these walls performing the same functions as the moistened clay in M. Becquerel's experiments; and he infers from his results, that the phenomena presented by the mineral veins of Cornwall are explicable on principles which are similar to those pointed out by M. Becquerel. It is thus rendered highly probable that the long-continued action of electricity of low tension has been at least one of the means by which crystallized bodies now existing in mineral veins have been produced.

But quite independently of the bearing of M. Becquerel's results on a question of great geological interest, the formation of crystals of metallic sulphurets and other substances by the agency of electricity was a great step in chemical science. As M. Becquerel very justly observes, the two branches of chemistry, analysis and synthesis, are at present in very different states. With the exception of crystals derived from aqueous solution,—which are by far the least abundant of natural crystals,—and a few from fusion, the great mass of crystallized bodies existing in nature had as yet remained inimitable by chemical processes. In the Memoirs referred to, not only are experiments described by which crystals of several of these substances have been obtained, but the principles are pointed out, by the application of which we may anticipate that large classes of others will be produced. M. Becquerel has thus opened a new field for inquiry and discovery, in which he has himself gathered the first fruits, but which still offers to future labourers the prospect of an abundant harvest of knowledge as regards both the recomposition of crystallized bodies, and also the processes which may have been employed by nature in the production of such bodies in the mineral kingdom.

A Copley Medal has been awarded to John Frederick Daniell, Esq., for his two papers on Voltaic Combinations, published in the Philosophical Transactions for 1836.

The Council are desirous of testifying, by this award, their sense of the great value of Mr. Daniell's invention of a new form of the voltaic battery, capable of producing, for a considerable length of time, a perfectly equal and steady current of electricity. The principles on which his apparatus, which he terms *the constant battery*, is constructed, were the results of a series of well-devised experiments, directed to the discovery of the cause of those great and often rapid variations in the power of the ordinary battery, which have hitherto limited its utility when employed for purposes of philosophical research, and the removal of which has greatly extended the range and multiplied the applications of this powerful instrument of chemical analysis.

The train of reasoning that led Mr. Daniell to this discovery, originated in an inquiry which he undertook with the view of determining with precision the influence exerted by the different parts of the voltaic battery in their various forms of combination. For

this purpose he contrived an apparatus which he designates by the name of *the dissected battery*, and which consists of a series of cylindrical glass vessels capable of holding the fluid electrolyte, with a pair of metallic plates immersed in it, each plate communicating below by means of a separate wire, with a small quantity of mercury, as the medium of the various communications which may at pleasure be made with other metallic parts of the apparatus. This arrangement affords peculiar advantages for studying the difference of effect in reference to the quantity and the intensity of the electric current, consequent on the different modes of connecting the elements of the battery, and also the influence of retarding forces resulting from other modes of connexion. In the course of these researches Mr. Daniell, observing the great extent of negative metallic surface over which the deoxidating influence of the positive metal appeared to manifest itself, was induced to institute a more careful examination of the circumstances attending this class of phenomena, and was led to the discovery of the gradual deposition of zinc on the platina plates being the principal cause of the progressive decline of the power of the battery. It was then that the means of counteracting this tendency presented itself to his mind. His plan consists in the constant application of a solution of sulphate of copper to the copper surface, while, at the same time, diluted sulphuric acid is constantly applied to the zinc surface, on which it exerts an oxidating and a solvent power, and is constantly renovated as it becomes charged with zinc. The two fluids are separated from one another by a partition formed of membrane, or other porous substance, which prevents intermixture, but offers no obstacle to the transmission of galvanic action. Two principal objects are accomplished by this arrangement of the constituent parts of the battery; first, the removal out of the circuit of the oxide of zinc, the deposit of which gradually reduces, and at length suspends, the action of the ordinary battery; and secondly, the absorption of the hydrogen evolved upon the surface of the copper, without the precipitation of any substance tending to counteract the voltaic action of that surface.

The advantages likely to arise to science from the invention of the constant voltaic battery are numerous and important. Mr. Daniell has shown how it may be made to supply a measure of chemical affinity, and has applied it with effect in the investigation of the influence of changes of temperature on voltaic action. The construction of a constant battery of large dimensions, which he has recently completed, has already opened new views of the possible application to economical purposes of the powers of voltaic electricity, an agent of which the influence appears to be so energetic and so widely diffused throughout nature.

The Council have adjudged one of the Royal Medals, in conformity with the announcement made in 1834, to Mr. Whewell, for his series of Researches on the subject of the Tides, which have been published in our Transactions during the last three years.

Mr. Whewell's researches have been chiefly directed to the three following points: first, the motion of the tide-wave at different points

of the ocean; secondly, the comparison of the *observed* laws at certain places with the *theory*; and lastly, the laws of the diurnal inequality of the tide.

It is to Mr. Lubbock that we are indebted for the first accurate comparison of the theory of the tides as given by Bernouilli in his treatise *Du flux et reflux de la mer*, with the results of observation as deduced from a period of nineteen years in the port of London. In this memoir, which was published in our Transactions for 1831, there was given a most elaborate discussion by Mr. Dessiou, under Mr. Lubbock's directions, of more than 13,000 observations, and the results were of great importance, not merely as furnishing the materials and the general rules for the construction of tide tables, but also for the general accordance which they exhibited with the equilibrium theory of Bernouilli, particularly with respect to the *semimenstrual inequality*. This agreement was the more important, as affording the indication of the real existence of a physical connection between the theory and observation, and as consequently justifying such a further examination of its consequences as might lead to the discovery or suggestion of such modifications of it as would lead to its general accordance with the laws of all the facts observed.

In a subsequent discussion of the tides of Liverpool, published in our Transactions in 1835 and 1836, Mr. Lubbock showed, as had partly indeed been suggested by Mr. Whewell in his papers on the empirical laws of the tides of London and Liverpool, that by referring the tide, not to the lunar transit immediately preceding, but to an anterior lunar transit, one, two, or more days before, that the formulæ furnished by the equilibrium theory would be brought into almost perfect accordance with the observed inequalities in the heights and times of the tides which are due to the changes in the moon's parallax. This was a most important step in the connexion between theory and observation, and has been found to apply, to a considerable extent, to all the periodical inequalities of the tides, though very different epochs are required for different inequalities. Thus Mr. Whewell has shown that the diurnal inequality in the heights of high and low water, which is due to the change in the moon's declination, would require to be referred to the lunar transit four days preceding.

But though the formulæ furnished by theory can be thus adjusted to represent generally the results of observation for any assigned station, yet our theory is quite incompetent to assign the physico-mathematical grounds upon which such adjustments are made: the complete solution of such a problem would probably require a knowledge of the laws of hydrodynamics much beyond that which we now possess.

The first memoir which was published by Mr. Whewell was an "Essay towards a first approximation to a map of cotidal lines," and appeared in our Transactions for 1833.

By *cotidal* lines, Mr. Whewell means those lines which may be drawn through all those points of the ocean which have high-water at the same moment of absolute time.

By analysing the movements of the tides as determined by the most simple considerations of the laws of fluid motion in open seas and in channels, and by explaining the circumstances of their convergence or divergence, their interference with each other, their retardation in shallow water, and their consequent tendency to sweep round the coasts and to approach them almost perpendicularly; and further, by discussing very carefully all the materials which nautical surveys and books of navigation could furnish him, Mr. Whewell was enabled to construct a map, which not only represented the general circumstances of the tides of the coasts of Great Britain, but likewise the movement of the great tidal wave, on the coasts of Europe, in the Atlantic Ocean, in the Indian seas, and on the coasts of New Zealand.

It was with a view to correct this first approximation to a map of cotidal lines that Mr. Whewell procured a very extensive series of observations to be made on the coasts of Great Britain and Ireland at 547 stations of the Coast Guard for an entire fortnight in June, 1834. These observations were repeated in June, 1835, and were accompanied by simultaneous observations made by the great maritime powers of Europe and North America, at the request of the Government of this country, at various stations on their coasts. The immense mass of observations, thus furnished, were reduced, under Mr. Whewell's directions, at the expense of the Admiralty, and some of the results, which are extremely important and interesting, have been communicated by him to the Royal Society in two Memoirs in our Transactions for 1835 and 1836. The last of these Memoirs was accompanied by a second map of the cotidal lines of the coasts of Europe, accompanied also by indications, effected by a peculiar notation, of the total range, in yards, of the tides at the different stations at which observations had been made.

Many very remarkable conclusions with respect to the motion of the tide-wave have resulted from these observations; amongst others may be mentioned the rotatory motion of the tide-wave which enters the German Ocean between the Orkneys and Norway, sends a southerly detachment along the coasts of Great Britain, which is reflected from the projecting coast of Norfolk upon the north coast of Germany, and meets the main wave again on the coast of Denmark.

It is impossible in the course of a very brief abstract like the present to notice all Mr. Whewell's researches in detail. His second great object was to compare the observed laws of the tides with the theory, or to propose such modifications of the forms of the theory as would reconcile it with the observations.

The interest which attaches to such investigations, which is so great during the progress of the structure which is to be raised upon them, ceases in many cases when the fabric is completed: a remark which is applicable to many of the most important researches and discoveries in philosophy, where we are accustomed to regard the last form only in which the theory is compared with the facts which are observed, and to forget or to neglect the series of

laborious investigations which have led to its establishment, but which are no longer necessary for its explanation or proof. This observation may be applied, in some degree, to his very ingenious Memoir "On the Empirical Laws of the Port of London", in which he attempts to deduce from observation and from very simple general considerations, the character of the formulæ for determining the establishment, the semimenstrual inequality, the corrections for lunar and solar parallax and declination, both as affecting the times and the height of high water. Similar observations may be extended to his papers on the "Empirical Laws of the Tides of the Port of Liverpool," and also on the "solar inequality and diurnal inequality" of the tides at the same place, which are full of valuable suggestions which the subsequent investigations of Mr. Lubbock have, in some cases, very remarkably confirmed and extended.

The last of the series of researches of Mr. Whewell relate to the diurnal inequality of the height of the tide, which the discussion of the tides at Liverpool had exhibited, though under circumstances much less striking than those which characterize its appearance in other places. The first of his memoirs on this subject relates to the diurnal inequality at Plymouth and Sincapore, at the last of which places its magnitude is very remarkable, making a difference of not less than six feet in the height of morning and evening tide, and quite sufficient to obliterate, under certain circumstances, one of the semi-diurnal tides, and explaining certain phænomena in the tides which have been considered as cases of interference. Mr. Whewell was led, from certain remarkable changes in the epoch of this phænomenon, which seemed to be deducible from the observations at Bristol, Liverpool and Leith, to suspect that its progress along the coasts of Europe and Great Britain was retarded according to some regular law. His subsequent discussion, however, of the simultaneous observations made in June, 1835, with an especial view to this inequality, showed that the differences of diurnal inequality were governed by local causes, and consequently negatived altogether the hypothesis of its progressive propagation according to a law distinct from that of the other inequalities of the tides.

The preceding abstract of Mr. Whewell's Researches on the Tides is necessarily very brief and imperfect, and little calculated to convey to the minds of those who have not read his very extensive series of memoirs an adequate notion of the amount of labour and of thought which the discussion of such extensive series of observations must have required.

The importance of the results which have been obtained by him and Mr. Lubbock, may be best estimated by the rapid advancement which has been made in our knowledge of the laws which regulate the movements of the tides during the last six years, and which is entirely owing to their joint labours. Theory, though little cultivated and little known, was then in advance of observation: tide tables were constructed by unpublished rules, which formed a profitable possession to those to whom the secret was known: and the distinctive characters of the tides in the different ports of this king-

dom, that of Liverpool perhaps excepted, were confined to the experience and tact of those who were accustomed to use them; but how different is the case at present! The rules for the construction of tide tables are not only public property, but are based upon the most extensive observations: laws, whose existence was hardly suspected, are now distinctly laid down: the progress of the waves in the most frequented parts of the ocean is beginning to be accurately developed: theory, which was formerly in advance of observation, though greatly improved in those parts of it which do not involve the hydrodynamical laws of the ocean, is now greatly behind it; and such a basis of facts has been laid down as may enable the mathematician to commence such a series of investigations, as may terminate in enabling another Laplace to give to the theory of the tides a form which may rival, in the certainty of its predictions, the almost perfect theories of physical astronomy.

On the motion of Mr. Davies Gilbert, the thanks of the Society were voted to His Royal Highness the President for his excellent Address, accompanied with a request that His Royal Highness would allow it to be printed.

The Statutes relating to the election of Council and Officers were then read by the Secretary; and Joseph Smith and Richard Horsman Solly, Esqrs., being nominated by the Chairman, with the approbation of the Meeting, Scrutators to assist the Secretaries in examining the balloting lists, the votes of the Fellows present were collected.

The ballot being taken, the Scrutators reported the following as the result:

President.—His Royal Highness the Duke of Sussex, K.G.

Treasurer.—Francis Baily, Esq.

Secretaries.—Peter Mark Roget, M.D.; Samuel Hunter Christie, Esq., MA.

Foreign Secretary.—William Henry Smyth, Capt. R.N.

Other Members of the Council.—John Bostock, M.D.; The Earl of Burlington; John George Children, Esq.; John Frederick Daniell, Esq.; Sir Philip Grey Egerton, Bart.; Davies Gilbert, Esq., D.C.L.; Charles Konig, Esq.; The Marquis of Northampton; Rev. George Peacock, M.A.; William Hasledine Pepys, Esq.; Stephen Peter Rigaud, Esq., M.A.; John Forbes Royle, M.D.; Benjamin Travers, Esq.; James Walker, Esq.; Charles Wheatstone, Esq.; Rev. William Whewell, M.A.

The thanks of the Society were then voted to the Scrutators, for their trouble in assisting at the Election.

The following is the statement with respect to the Receipts and Payments of the Society during the preceding year, which was laid on the table by the Treasurer.

Statement of the Receipts and Payments of the Royal Society between Nov. 29, 1836, and Nov. 29, 1837.

RECEIPTS.

	£.	s.	d.
Balance in the hands of the Treasurer at the last Audit ..	533	4	11
33 Weekly Contributions, at one shilling	85	16	0
109 Quarterly Contributions, at £1	445	10	0
23 Admission Fees	230	0	0
7 Compositions for Annual Payments at £60.	420	0	0
Rents :—			
One year's rent of estate at Mablethorpe: due at Michaelmas, (less the expenses of defending the Tythe suit, £16 13 0)	90	7	0
One year's rent of lands at Acton: due at Michaelmas	60	0	0
One year's fee-farm rent of lands in Sussex; land-tax deducted: due at Michaelmas ..	19	4	0
One fifth of the clear rent of an estate at Lambeth Hill, from the Royal College of Physicians, in pursuance of Lady Sadleir's will: due at Midsummer.....	3	0	0
		172	11 0
Dividends on Stock :—			
One year's dividend on £14,000 Reduced 3 per cent. Annuities	420	0	0
One year's dividend on £200 Consols	6	0	0
Dividend on £3452. 1. 1 Consols, the produce of the sale of the premises in Coleman-street.....	103	11	2
<i>Donation Fund.</i>			
One year's dividend on £3820. 19. 3 Consols	114	12	6
<i>Rumford Fund.</i>			
One year's dividend on £2161. 0. 10 Consols	64	16	8
<i>Fairchild Fund.</i>			
One year's dividend on £100 New South Sea Annuities	3	0	0
		712	0 4
Miscellaneous Receipts :—			
Sale of Philosophical Transactions.....	278	7	2
Abstracts of Papers.....	7	18	6
Index to the volumes.....	1	8	6
		287	14 2
Total Receipts	£2886	16	5

PAYMENTS.

	£.	s.	d.
<i>Bakerian Lecture.</i> —William H. Fox Talbot, Esq., for the Bakerian Lecture.....	4	0	0
<i>Donation Fund.</i> Newman, for Barometer, &c.	32	19	3
Cost of £329. 0s. 9d. Consols.....	300	4	9
<i>British Museum Fund.</i> Baillière for Books.....	111	2	6
Salaries:—	448	6	6
	£.	s.	d.
Dr. Roget, one year, as Secretary	105	0	0
J. G. Children, Esq., one year, as Secretary..	105	0	0
Ditto for Index to Phil. Trans.	5	5	0
C. Konig, Esq., one year, as Foreign Secretary	20	0	0
Mr. Robertson, one year, as Assistant-Secretary	160	0	0
Mr. W. E. Shuckard, one year as Librarian..	50	0	0
Mr. Holtzer, one year, as Porter.....	30	0	0
Ditto, for extra Portorage	10	0	0
	485	5	0
Fire Insurance, on the Society's Property	22	11	6
Mrs. Coppard: Gratuity.....	10	0	0
Gratuity to the Infant School at Acton	10	0	0
Bills:—			
Taylor:			
On account of printing the Catalogue.....	200	0	0
Ditto:			
Printing the Phil. Trans., 1836, part 2, and 1837, part 1; Proceedings, Nos. 26—29, and Index; Circulars, Lists of Fellows, Ballot-lists, Statement of Payments, and Minutes of Council; &c. &c.	590	19	11
Bowles and Gardiner:			
For Paper for the Phil. Trans., 1837, parts 1 and 2.....	153	4	0
Basire:			
For Engraving and Copper-plate Printing for Phil. Trans., 1837, parts 1 and 2, &c.	328	2	3
Gyde:			
Sewing and Boarding 1079 Parts of Phil. Trans., and 250 Abstracts	63	16	8
	1136	2	10
Packer:			
For Engrossing the Address to Queen ..	5	11	0
Chappell:			
For Stationery	13	1	0
Carried forward	18	12	0
	2312	5	10

	£.	s.	d.	£.	s.	d.
Brought forward	18	12	0	23	12	5
Saunderson :						
For Shipping Expenses	2	14	11			
Brecknell and Turner :						
For Wax Lights, Candles, and Lamp Oil	36	16	0			
Skelton :						
For Cleaning Chandeliers, and repairing Lamps, Locks, &c.....	7	7	7			
Cubitt :						
For Repairing Windows, Carpets, &c....	7	1	1			
Cobbett and Son :						
For Window-cleaning and Glazing.....	2	14	0			
Gwillim :						
For Brushes, Fire wood, &c.	2	17	9			
Exchequer Fee for paying dividend		13	0			
Caldecott :						
For Furniture.....	28	9	2			
Wood :						
For Coals	35	19	0			
Murray :						
For taking Meteorological Observations..	7	0	0			
				150	4	6
Taxes and Parish Rates :						
Land Tax	1	17	6			
Ditto Arrears (2 years)	6	5	0			
Poor Rate	6	0	0			
Church Rate		15	0			
Rector's Rate.....		7	6			
Sewers Rate	3	0	0			
				18	5	0
Petty Charges :						
L' Institut	2	5	0			
Silliman's Journal	1	2	6			
Attending Clocks	1	11	6			
Postage and Carriage.....	9	15	0			
Extra Messenger	1	3	6			
Expenses on Foreign Packets, &c.	6	18	11			
Stamps	2	12	6			
Charwoman's Wages	27	6	0			
Extra Charwoman's work	3	7	6			
Miscellaneous expenses	12	15	0			
				68	17	5
Total Payments....	£2549	12	9			
Balance in the hands of the Treasurer	337	3	8			
	£2886	16	5			

FRANCIS BAILY, *Treasurer.*

November 29th, 1837.

The Balances in hand, now belonging to the several trusts, are as under :
viz :—

	£.	s.	d.
<i>British Museum Fund</i>	245	3	4
<i>Donation Fund</i>	109	6	4
<i>Rumford Fund</i>	194	10	0

The following table shows the progress and present state of the Society, with respect to the number of Fellows :

	Patron and Honorary.	Foreign.	Having com- pounded.	Paying £2. 12. Annually.	Paying £4 Annually.	Total.
November, 1836	10	46	591	37	109	793
Since elected	1	4	4	.....	22	31
Since deceased, &c.	-1	-2	-24	-3	-1	-31
Since compounded	.....	.....	3	.....	-3	....
Defaulters	.....	.....	.....	-2	-3	-5
November, 1837	10	48	574	32	124	788